Guide to Implementing Community Scale Wind Projects on Native American Reservations

Tyson J. Utt

Office of Science, Energy Research Undergraduate Energy Fellowship (ERULF)

James Madison University

National Renewable Energy Laboratory

Golden, Colorado

August 15, 2002

Prepared in partial fulfillment of the requirements of the Office of Science, Department of Energy's Energy Research Undergraduate Laboratory Fellowship under the direction of Tony Jimenez and Bob Gough at the National Wind Technology Center for the National Renewable Energy Laboratory.

Participant: ______________________________

Mentor: ______________________________

Mentor: ______________________________

Guide to Implementing Community Scale Wind Projects on Native American Reservations

Introduction:

Many tribes have an ideal situation for developing community sized wind projects on their reservations. The incentives include, but are not limited to, abundant wind resources; sovereignty to control political and economic issues; federal support through development programs; and tribally owned community loads such as office buildings or casinos. Implementing a wind project to supplement the electricity demand of a tribally owned building presents some political and economical considerations unique to a tribal setting. The focus of this paper is how to implement a community wind project on tribal lands.

This document is designed to assist Native American tribes in implementing a properly sized wind project in order to supplement the electricity demand of a large community load. This document is entitled a guide because it is intended to guide the user to resources for completing the necessary steps of implementing a wind project. This document also focuses on identifying issues unique to community scale wind projects on Native American Reservations.

Wind resources coincide with the location of tribal lands throughout the western portion of the United States. Much of the promising wind resources are found in the Great Plains and the Pacific Northwest. Tribes can begin to develop these wind resources to promote their own economic development and the development of wind energy.

Picture provided by NREL - http://www.nrel.gov/data/pix/

How to use this document:

This document outlines chronological steps to guide a tribe through the necessary stages of implementing their community scale wind project. Information will be provided at each step to familiarize the user with the topic. Issues concerning community scale wind projects and Native American reservations are addressed in various sections. At the conclusion of this document the user will be directed to resources for further information. This feature allows the document to serve as a stepping-stone to access technical resources via the internet. This document will provide the tribe with a general education of the various procedures in a wind project so the tribe may be well informed when working with a wind development company.

Table of Contents:

Options for Tribal Wind Projects:

Wind projects are scaled on three levels: small isolated systems, midsize distributed systems, and utility scale systems. Each level of wind project is designed for a specific situation and has related pros and cons. This section will briefly outline the various wind project options for tribes, then discuss the reasoning for focusing this document on a community scale project.

Brief description of project options:

Small isolated systems: These projects usually range from 20 W to 10 kW. Economically these systems are competing against the cost of extending grid transmission lines, which can cost between $30,000 and $45,000 per mile. Private tribal members who currently do not have electricity due to a remote location from the electric grid may consider this scale of wind projects. These systems require a battery storage system to match energy availability with load demand.

Midsize distributed systems: These projects usually range from 1 kW to 250 kW but can be larger. Economically these projects are competing against the retail price of electricity in the area, which averages about 8 cents per kWh. These projects typically consist of one turbine connected to the grid and require high utility prices to be economically feasible. The grid serves the purpose of the an energy storage system by providing electricity when the renewable resource does not match the electricity demand.

Utility scale wind farms: These projects can range from a few MW to several hundred MW. Economically these projects are competing against the cost of generating wholesale electricity, which has dropped down around 2 to 4 cents per kilowatt hour in recent years. These projects are often known as wind farms with their arrays of gigantic turbines harvesting an excellent wind resource.

Project focus of this paper:

This paper focuses on the midsize distributed wind project due to its potential for use on Native American Reservations. Projects of this scale are excellent for introducing a tribe to the capabilities of wind energy. The project will be able to supplement the power of a community building thus securing community support. The project will reduce electric bills for the building by directly providing electricity and also net metering in available states. This scale project will provide a stepping-stone for a tribe that wishes to pursue larger scale projects in the future. The key steps and resources will be laid out in the following pages to assist the tribe with its first wind project.

Develop Tribal Support:

Joint tribal support is key to successfully implementing the first community wind project. Creating community support will help to unify the efforts of many into an effective team for completing a community wind project. Misinformed public opinions of wind projects are often a barrier to gaining support from the local community. Education is an important step in reducing the levels of criticism from the community.

Educate community on wind power:

Education is the most important step to gaining community support for a wind project. Provide town meetings for all who are interested. Be prepared to answer many questions of concern with solid facts that are available through educational materials (see resources). Support can be created by informing the community of the potential social, environmental, and economic benefits from generating electricity from wind power. These potentials include are:

- Lower monthly energy bill
- Lessen dependence on utility
- Lower harmful emissions from fossil fuel energy production

Organize tribal effort:

Tribal governments commonly fund community projects. The tribal government may request direct participation from individuals in the community to assist in the projects development. Employees from the project building can greatly assist in the load energy budgeting process and energy consumption reduction process. At some point the tribal government will seek the employment of a wind development company or dealer that may play different roles of involvement. The tribal government could hand all the responsibilities of the project to this company and only serve as an advisor on tribal issues. The tribe may also take a more active role and conduct preliminary stages of the project with out assistance from an outside company. It is recommended that a private company with experience in the state be consulted throughout the project.

Evaluate Community Wind Resource:

One of the most important criteria for determining the feasibility of a wind project is the level of wind resource available. The amount of energy that can be harnessed from the wind is greatly dependent on the wind speed. Small to midsize wind turbines generally need at least a class 2 wind resource, which averages 9 to 11 miles per hour. The following equation is commonly used by manufactures to determine the power produced by a turbine given specific conditions.

Power Produced = C_p ½ ρ A V^3

Where

$\mathbf{C_p}$ is the power coefficient experiencing efficiency losses (ranging from .2 to .4) Theoritical max is .59 known as Betz Limit.

ρ is the air density (lb/ft^3) at sea level ≅ .075 (lb/ft^3)

A is the area swept by the rotor which is equal to $\pi * D^2/4$ where D is the rotor diameter

V is the wind speed in mph

Because **V** is cubed (**V^3**) it has a much larger influence in determining the power produced by the turbine. Therefore, it is important to site the turbine where the wind resource is at high speeds. It should also be noted that wind speed increases with elevation. The wind shear is a variable that describes how much the speed differs with elevation.

Access to hilltops, ridgelines, or high plains will increase the likely hood of a good wind resource. Community siting criteria concerning land ownership and sacred grounds will need to be determined as early as possible to insure data collection from a reasonable area. Data collected within a reasonable distance from later determined turbine location can be interpolated from the anemometer location to the turbine location using the available software packages. Data collection of wind speeds and direction will need to be conducted for a minimum of one year. Anemometer towers are available for loan from Wind Powering America with the goal of promoting the growth of wind power throughout the United States with an area of emphasis focusing on Native Americans.

Anemometer, wind vein, and data logger are available for loan from Wind Powering America. www.eren.doe.gov/windpoweringamerica

Factors for anemometer siting:

When siting an anemometer, several factors must be considered.

- Potential wind resource
- Obstructions
- Land rights
- Grid access
- Load access

The considerations necessary for siting an anemometer are the same as the considerations for siting the actual turbine.

The anemometer should be located in an area with a predicted substantial wind resource. These areas can be predicted by geographic formations such as ridgelines and wide-open plains. Vegetation indicators such as "laid down" grass or the disproportional growth of limbs on one side of an evergreen known as flagging can serve as a good indicator.

The anemometer and potential turbine site should not be near obstacles with a potential for disrupting the flow of the wind known as turbulence. Examples of obstacles to watch for are buildings of any size and also large vegetation. Also consider the future construction of buildings or the growth of vegetation. The turbine hub should be located no less than 300 feet away and 30 feet higher from any substantial obstacle that can cause turbulence. Further information is available concerning specific tower to obstacle distances as well as recent laws to restrict construction of wind obstacles near wind farms.

Land rights will be an important issue in siting wind turbines in a Native American community. A community turbine can be placed on private, public, tribal, or federal lands, all of which carry specific implications to erecting a turbine. The location of the turbine will have an affect on who is able to tax the production of electricity. Because this turbine will serve a community load it will most likely be located on tribally owned land. This land may be within a commercial area, so substantial space must be available for the lifetime of the project. An area of one to two acres will be necessary to reduce the disruption of surrounding businesses.

When the turbine is erected it will be located a close as possible to transmission lines for connection to the electric grid or load it will serve. Laying wires for transmission is cost prohibitive and therefore should influence the location of a wind resource assessment and eventual turbine.

Project Preparation:

The following section will outline several key steps that play an indirect role in implementing the community wind project. These steps are of critical importance to insure the legality and economic feasibility of the wind project. These steps should begin as soon as possible and are great to keep project activity high during the year of wind resource assessment.

Prepare an environmental assessment:

An environmental assessment (EA) will need to be conducted in order to secure permitting for the turbine site. The assessment should consider both the construction phase and the operation & maintenance phase of the project. The assessment should address issues concerning outlined by the Endangered Species Act, the Migratory Bird Treaty Act, the National Historic Preservation Act, and any sacred land concerns of the tribe. Remaining consistent with tribal values the project should not cause excess harm to the surrounding environment. Concern may arise from avian issues or from ground disruption from laying transmission lines. Aesthetic, noise, and radio signal interference issues may also be addressed in the environmental assessment.

Permitting:

The federal government is taking an active role in promoting renewable energy projects by allowing right-of-way applications for wind assessment and project permitting. Though these permits are given top priority all the necessary steps are required.

Tribes have the ability to declare their own building codes or zoning regulations for construction on tribal lands. Wind projects that are located in residential areas are often subject to local codes that restrict tower height. Tribes can greatly benefit by creating or modifying construction codes that are advantageous to turbine installations. This would call for the allowance of tall towers possibly in and/or around residential and commercial areas. Zoning codes that restrict the location of the turbine can also inhibit the permitting process. This may require that the turbine be erected further from the load thus increase transmission costs. Electrical codes also regulate the laying of transmission lines and can significantly increase transmission costs. Transmission lines may require the disruption of sidewalks or streets in order to access the community load.

Some tribes may not have regulations in place; therefore, the project will be unregulated in that area but must still maintain safety as a top priority. Permitting typically requires a charge of a couple hundred dollars and copies of zoning plans, construction plans, and approval from a professional engineer. These steps should be enforced on tribal lands but the waived fee can be another benefit.

Communicate with local utility:

Communication with the local utility is important for any energy generation project. This process is especially important with the requirements of grid-connected projects. Because the wind turbine will be connected to the consumer side of the electric meter the project will be able to use net metering benefits available in some states. Check with the utility to determine their specific requirements with net metering because some utilities require a second meter for the turbine produced electricity. The utility may also impose a grid connection charge and require that the tribe maintain insurance on the project. Because connecting to the electric grid will greatly increase the feasibility of the project by reducing storage cost the utility should be worked with as an equal contributor to this project.

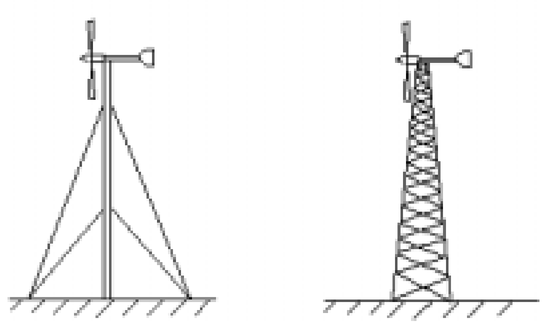
Determine load energy budget:

Determining the load requirements of the building to be served by the project will be necessary to help specify the proper size of the wind turbine. Careful records on energy consumption should be kept during the year that the wind resource assessment is being conducted. Including diurnal and seasonal load patterns to determine if the wind resource will likely match the load requirement. This may be important if net metering is available only on a monthly basis. Methods for reducing the load should be examined. Finding practical means of reducing one's electrical energy consumption will lesson the load requirements thus reducing electrical bills and indirectly contributing to reducing the needed size of the community wind turbine. The reductions will lead to significant savings in both the upfront capital and the long-term investment. Energy efficient measures must be done first to insure the economics of the wind project.

Design Community Wind Project:

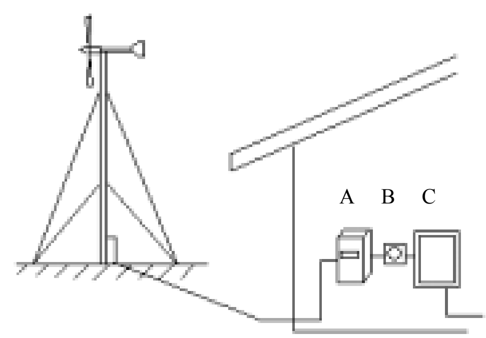
The configuration of a turbine and its' infrastructure is unique to each installation. This section will outline the general considerations needed for sizing and locating the community wind turbine. Besides sizing and locating other issues such as tower design and supporting infrastructure need to be considered.

Taller towers are able to raise the turbine higher in the sky where wind resources are faster and more consistent. Towers can also vary in design. Guyed towers are a tubular pole design with wires branching off the tour and securing to the ground a distance of about two-thirds the height of the tower. Towers may also be a lattice design that stands on a concrete foundation and does not require guy wires. Guyed towers are generally less expensive but require more space. Lattice towers require less space but are more expensive and do not allow ground access for maintenance.



The left image is a guyed tower while the right image is a lattice tower.

Before the turbine can produce electricity additional electronic infrastructure will need to be installed in order to control the electricity produced. Transmission lines will need to be installed to transport the produced electricity. A power conditioner will convert the electricity produced by the turbine into "clean" electricity that matches the grid so it can be fed onto the grid for net metering. The power conditioner will also cease turbine production incase of a grid outage. The electricity is fed into the building by the breaker panel along side the grid connection. Finally, a meter will monitor how much electricity is produced and credit this amount for net metering purposes. Some utilities require two meters, one for monitoring electricity production and one for monitoring electricity bought from the utility. Connecting the transmission lines to the consumer side of the grid will allow the consumer access to net metering when available.



The turbine-produced electricity is fed to the load through the (A) power conditioner, (B) meter, (C) breaker panel.

Locate community wind turbine:

The location of the tower will affect the wind resource available the cost of transmission the permitting codes that apply and maybe the style of tower. The factors that determine a good site for the wind resource were discussed earlier in the section on siting the wind anemometer. Hopefully careful consideration has been taken in siting the anemometer so that the placement of the turbine will be chosen accordingly. Many issues must be considered first. Will the turbine impede or be impeded by any future construction plans? Laws are now in place which restrict the future construction of objects that interfere with wind resources for installed turbines.

Size community wind turbine:

Combining the information from the wind resource assessment with the information from the load energy budget will provide the needed information for selecting a turbine model and size. This information will need to be shared with several turbine companies to insure that the best turbine for the job can be bought for the best price. Incentives can also play a role in determining turbine size.

Picture provided by NREL - http://www.nrel.gov/data/pix/

If net metering is available then the turbine should be sized to insure that the annual production of electricity will be equal to or slightly less than the building consumption. If net metering is not available then the turbine production should be kept significantly less than the building load. The cost of mid size turbines is any where from 2 to 4 dollars per watt rating. So it is imperative to reduce the energy load before purchasing the turbine to insure proper sizing and economics.

Develop Economic Analysis:

A common motivation for purchasing a wind turbine is the economic burden of high electricity bills due to high rates from the utility. According to a report by the Energy Information Administration, Native American reservations pay just slightly higher rates for electricity compared to the national average. Native Americans do spend a higher percentage of income on electricity as compared to the national average. Though the motivation to be environmentally friendly supports wind turbines, the bottom line on feasibility is often drawn with an economic analysis. If the economic burden of a high electric bill and the support of a good wind resource and several incentives are in place then wind project economics can be justified. With newly revised laws and regulations the economic analysis of the wind project must be done very carefully. Assumptions of 2 to 4 dollars per watt installed are often to broad and uninformative when analyzing a specific project.

An economic analysis for the tribal wind project should be organized around the payback period of the project. That is to say: how long will it take for the project to recover its own costs and begin generating revenue? Because community scale wind projects are grid connected they will economically compete against the price of retail electricity. The analysis will compare the total cost of generating electricity for the lifetime of the turbine to the cost of continuing to pay retail electricity rates from the utility. Special considerations are as follows:

- Fluctuation of retail electricity prices
- Decrease efficiency over turbine life
- Unscheduled maintenance
- Alteration in load demand

These considerations will play a role in determining the net present value of the investment once the lifetime of the project is complete. The economic analysis will need to incorporate available funding assistance and incentives available from state, federal, and tribal levels.

Funding options:

A wind project may appear to be too expensive for a tribe to finance on its own. Tribes have several options to find funding assistance. Funding for community scale wind projects on tribal lands may come from federal programs designed to support the economic growth of Native American communities and the growth of renewable energy. Tribes may also seek financial assistance from private investors or by applying for commercial loans. Tribes have unique funding opportunities from gaming revenues and special federal loan programs. Funding options may be available from organizations listed below.

- Department of Energy
- Bureau of Indian Affairs
- Rural Utilities Service
- Economic Development Administration

Incentives on tribal, state, and federal levels:

Tribes can greatly benefits from incentives on several levels. These incentives can make or break the feasibility of a community wind project. Tribal sovereignty allows for the tribes to set their own tax laws. Therefore, laws may be put into place to support the development of renewable energy projects. Also, tribal sovereignty exempts tribes from the federal taxes. Several states have tax incentives in place for renewable projects. Many states have also required utilities to allow net metering.

Utility:

The utility plays a key role in the economic analysis for several reasons. One, the utility sets the electricity rates in terms of cents per kWh's that often become high enough to justify the research of alternative energy supplies. Two, the utility owns and operates the grid that the wind turbine will connect and feed electricity to when load demand drops. This gives the utility the right to regulate the quality and quantity of electricity fed onto their grid. Utilities also have the right to charge for grid connection and enforce insurance policies upon project owners. Thirdly, the utility may or may not have net metering programs (state dependent) that allow the project owner to receive credit at retail rates for electricity fed onto the grid. These three factors justify the need for close communications between the project planners and the utility.

The Public Utility Regulatory Policies Act (PURPA) requires that the utility allow the project to be connected to the grid and treated like an independent power producer. This act insures the competitive actions of the utility with wind projects, yet gives them the power to enforce quality standards. If the project can not connect to the consumer side of the grid it will be considered an independent power producer and be subject to selling electricity onto the grid at the utilities escaped cost which is between 2 and 4 cents per kWh.

A complete economic analysis will need to be conducted in order to predict the pay back period for the project. Factors that have been mentioned and will influence the economics are as follows:

- Wind resource
- Cost of electricity
- Consumer load
- Rebates and incentives
- Turbine and infrastructure

Additional costs can add to the initial investment, such as, hiring a dealer for installation and maintenance. The long-term savings from reduced electric bills over the next 20 to 40 years of operation will gradually pay off the project and may provide additional savings.

Implement Wind Turbine Project:

Once the tribe has completed all the necessary preparation work for the wind project the purchase and installation can take place. This section will discuss options for purchasing a wind turbine and the options for installation and maintenance.

Purchase of turbine:

Now the tribe is close to benefiting from all the preliminary work. The turbine size required has been determined from the load demand and the resource availability. Now the tribe must search the market for bidders who are able to match the turbine needs with the best price. There are three options for purchasing a wind turbine. The tribe may purchase direct from a turbine-manufacturing factory, from a qualified turbine dealer, or from a qualified turbine reseller. All options have their benefits. A turbine manufacturer can provide low prices but will lack in the hands on assistance with installation and maintenance. The dealer will sell the same turbine for a little more but provide additional services like installation and maintenance. And a reseller can provide a refurbished turbine for a much cheaper cost.

Installation of turbine:

For the turbine installation the tribe may choose to erect the turbine and electrical infrastructure on their own if they have the personnel and resources available. The tribe may also contract the job to a qualified company with experience installing wind turbines. It is recommended that the tribe seek assistance with the installation of such an investment. The manufacturer or dealer who sold the turbine will be able to guide the tribe towards local assistance with installation.

Begin generating electricity:

The electrical infrastructure will most likely need to be installed by an experienced electrician who again can be recommended by the manufacturer or dealer. Once the turbine and electrical infrastructure has been installed and tested the production of electricity may begin. At this point, records of the turbine and its' production should be kept to monitor the long-term performance. With this data the results of the economic analysis can be verified and adjustments for long term funding can be corrected.

Follow-up Procedures:

The wind project has now successfully been implemented and the benefits from clean energy can begin to be appreciated. Once the turbine is operational it will begin to reduce harmful emission, electricity bills and dependence on the utility. The benefits of the turbines can last from 20 to nearly 30 years with the lifetime of the machine; therefore, long-term plans should be developed for future considerations. The operation and maintenance of the turbine will be key to prolonging the life of the project.

Operation and maintenance:

It is time to insure that the tribe will continue to benefit from this resource by maintaining the turbine's performance. This means periodic maintenance to insure a long lifetime of the product and protection against exposure from harmful elements. The tribe may choose to seek the services of the turbine company or contractor who installed the system. This may be most wise to insure consistent service and maintain relations. The tribe may also choose to train an individual to be responsible for minor problems that may arise and not require the expense of professional assistance.

Progress and future:

Many tribes have an ideal situation for developing community size wind projects on their reservations. This guide has provided general information through an outline of the steps necessary for implementing such a project. The continued education of the tribe is necessary to fully implement a successful project. Links are provided in the next pages to direct the user to additional resource to continue the education process. Once the tribe has properly educated themselves they can implement a wind project to best match their community needs. Hopefully the community size wind project will continue to benefit the tribe for many years to come.

Glossary:

Anemometer: An instrument used to measure wind speed.

Angle of attack: The angle at which turbine blades see wind due to the combine vectors of rotational and wind direction.

Cut-in Wind Speed: The wind speed necessary for a turbine to begin generating electricity.

Cut-out Wind Speed: The wind speed necessary for a turbine to cease generating electricity.

Density: Mass per unit volume.

Diurnal: Occurring during a 24-hour period.

Distributed System: Often refers to a generating system not connect to the electric grid.

Furling: A passive means of changing the angle of attack to reduce affective wind speed on turbine.

Grid: Distribution system for transporting electricity from producer to consumer.

kW: A unit of power for electricity equal to 1,000 watts.

kWh: A unit of energy for one kW of power used in one hour.

MW: A measure of power for electricity equal to 1,000 kW.

Nacelle: housing located at top of tour to contain and protect gears and generators.

Net Metering: When electricity is put onto the grid at retail price by slowing or spinning the utility meter backwards.

Net Present Value: The value of money today that will equal a future value of money.

Power Coefficient: The ratio of power produced by a turbine to the power available.

Power Conditioner: A device used to convert DC current into grid friendly 60 hertz AC current.

Power Curve: A graph displaying a turbines output for a variety of wind speeds.

Rated Output Capacity: The published output of a turbine for a specified wind speed.

Rotor: The combination of the blades and hub that rotate to produce torque for the turbine.

Rotor Diameter: Twice the length of one blade.

Swept Area: The total area of wind intercepted by rotating blades.

Turbulence: Changes in wind speed and/or direction because of disturbance from obstacles.

Velocity: The rate of speed for an action.

Wind Farm or Wind Plant: A collection of large wind turbines to produce electricity for wholesale.

Wind Shear: The rate at which wind speed increases with elevation. Often determined by terrain.

Yaw: The rotation of the nacelle to change the angle of attack on the turbine blades.

Resources:

American Wind Energy Association (AWEA): www.awea.org

Small Wind Systems:
http://www.awea.org/smallwind.html
Provides links to information on small wind education, manufactures, state-by-state incentives, and policy.

Information and Resources:
http://www.awea.org/windinfo.html
Provides link to wind information including reports, events and resource links.

Wind Energy and Energy Policy
http://www.awea.org/policy/index.html
Provides links to topics concerning economic and environmental policy.

Department of Energy (DOE): www.doe.gov

e-Center:
http://www.pr.doe.gov/
Provides information on obtaining financial assistance awards.

Office of Energy Efficiency and Renewable Energy
http://www.eren.doe.gov/RE/wind.html
Provides general educational materials on wind energy.

Energy Efficiency and Renewable Energy Network
Wind Energy Program: http://www.eren.doe.gov/wind/
Provides general educational materials on wind energy.

Consumer Guide to Renewable Energy:
http://www.eren.doe.gov/power/consumer/makecleanelec.html
A Guide for home and Business to issues of choosing renewable resources.

National Wind Technology Center (NWTC): http://www.nrel.gov/wind/

Consumer Energy Information: EREC Fact Sheet:
http://www.eren.doe.gov/erec/factsheets/wind.html
Provides guidance with wind project issues.

Wind Resource Database:
http://www.nrel.gov/wind/database.html
Provides links to wind resource maps and other meteorological information.

Information Resources:
http://www.nrel.gov/wind/info_res.html
Provides a directory to information from additional links to published documents.

Wind Powering America (WPA):http://www.eren.doe.gov/windpoweringamerica/

Native Americans:
http://www.eren.doe.gov/windpoweringamerica/native_americans.html
Provides information on WPA's Native American program and links to projects.

Wind Powering America Publications:
http://www.eren.doe.gov/windpoweringamerica/wpa_publications.html
Provides links to recent publications including a small wind guide for homeowners.

Native American Anemometer Loan Program:
http://www.eren.doe.gov/windpoweringamerica/na_anemometer_loan.html
Provides information for contacts concerning anemometer loans for wind measurements.

National Wind Coordinating Committee: http://www.nationalwind.org/

Technical Assistance
http://www.nationalwind.org/technical/default.htm
Provides names of individuals to contact with special skills.

Publications
http://www.nationalwind.org/pubs/default.htm
Provides large amount of information with an excellent list of publications.

Additional Sources:

Bergey Wind Company: www.bergey.com
Performance and Economics: http://www.bergey.com/Channels/1F2.htm
Provides an interface to calculate the payback period of a wind system.

Database of State Incentives for Renewable Energy
http://www.dsireusa.org/
Provides state-by-state economic incentives for energy.

Office of Technology Access: Tribal Energy Program
http://www.eren.doe.gov/power/tech_access/tribalenergy/
Provides information on financial and technical assistance to tribes concerning energy.

James and James Science Publishers: Renewable Energy World
http://www.jxj.com/magsandj/rew/index.html
Provides a link to suppliers and services for renewable energy.

Sandia National Laboratories: Wind Energy Technologies
http://www.sandia.gov/wind/
Provides links to information and publications.

Utility Wind Interest Group, Inc.
http://www.uwig.org/
Provides information on steps utilities are taking to incorporate wind energy.

Interstate Renewable Energy Council
http://www.irecusa.org/othersites.html
Provides information on incentives and grid connection.